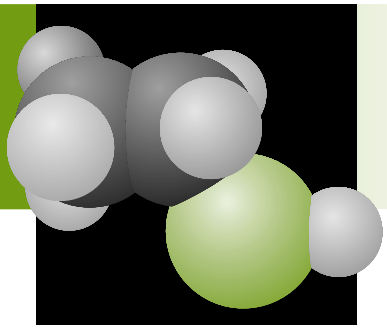
CHEMICALS
Project Fact Sheet

A Steam System Technical Case Study



Modernizing Controls Reduces Steam Consumption at ExxonMobil Chemical Plant

Benefits

- Lowered costs by 20%
- Reduced annual steam consumption by 43 billion Btu
- Increased product recovery
- Reduced air emissions

Applications

Improving steam system control strategies can increase the performance of almost any steam system. Steam systems are found throughout industry and consume a significant portion of the energy used at manufacturing plants.

Summary

In 1997, the instrumentation and controls on a 40-year-old isoprene recovery unit at the ExxonMobil chemical plant in Baton Rouge, Louisiana, were upgraded from a pneumatic system to an advanced digital distribution control system. By upgrading to a digital control system, this unit's functionality was greatly improved and its consumption of steam was reduced by 11% per unit of feedstock. The project reduced annual steam consumption by about 50 million pounds, or 43 billion Btu, and as additional advanced controls are implemented, these energy savings are expected to increase. Energy savings accounted for about 20% of overall annual savings from the project, with other savings coming from improved product yield, reduced maintenance, and lower staffing requirements. The project cost several million dollars and the simple payback was about 4 years. As a result of the project, the plant received a 1997 Chemical Manufacturers Association Energy Efficiency Award.

Plant Overview

The isoprene recovery unit this project focused on is known as Diolefins-Louisiana (DILA). The 40-year old process unit was one of the last units in ExxonMobil's Baton Rouge chemical plant to be upgraded from older pneumatic controls to a digital distributed control system.

Project Overview

While the pneumatic controls were functional, they did not allow for close control of the unit's operations, which resulted in inefficient operation of the unit relative to other units whose instrumentation had been upgraded to

ExxonMobil Baton Rouge Plant

electronic or digital controls. Since other process units at the Baton Rouge plant had been upgraded to electronic or digital controls, personnel at the plant were well aware of the energy savings that could be realized from such an upgrade. However, it was the improved functionality of the unit combined with the energy savings that justified the modernization of the instruments.

Project Implementation

The project, which took one and a half years to execute, was completed in 1997 at a cost of several million dollars. The pneumatic field instruments were replaced with digital controls and were moved from the unit's strip chart panels to a modern computer console in a centralized control center. During the project's execution the unit was able to remain in service at high production rates and several aspects of the plant's operation were combined to facilitate the installation of the digital controls.

Project Results

The installation of digital controls benefited the plant in many ways. In terms of reduced energy costs alone, the new instrumentation has lowered costs by 20%. This is because the process unit has decreased its 135 psig steam consumption per-pound-of-unit feedstock by 11%. In 1998, the unit's steam consumption had been reduced by 50 million pounds, or 43 billion Btu compared with the previous year.

The digital controls operate the unit more efficiently than the pneumatic ones by monitoring the unit more closely and reducing process upsets, leading to greater product recovery. This is because the new instruments control unit operations with far greater accuracy and faster response time. This capability improves product yield by recovering portions of the prime product formerly lost via downgrade to lower value fuel or motor gasoline streams.

In addition, cost savings have resulted from lower maintenance costs (the digital instruments don't need as much upkeep as the pneumatic system required) and lower overhead from reduced staffing since the unit's operation is now controlled from a centralized control center.

Lessons Learned

As a result of the upgrade, ExxonMobil has realized substantial energy cost savings and improved the efficiency of an isoprene process recovery unit. In addition to energy savings, increased product recovery, and other cost savings, there is also a benefit from lower pollutant emissions leading to a more environmentally friendly operation. ExxonMobil has also developed a methodology for determining when to apply advanced control strategies to minimize energy consumption per pound of production. This methodology can be employed at other chemical plants or industrial manufacturing sites.

Industries of the Future

The chemicals industry is one of several energy-and waste-intensive industries that participate in OIT's Industries of the Future initiative. In December 1996, the chemicals industry published a report, entitled Technology Vision 2020: The U.S. Chemical Industry, that helps establish technical priorities for improving the industry's competitiveness and develops recommendations to strengthen cooperation among industry, government, and academia. It also provides direction for continuous improvement through step-change technology in new chemical science and engineering technology, supply chain management, information systems, and manufacturing and operations.

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The Department of Energy's Office of Industrial Technologies (OIT), through partnerships with industry, government, and non-government organizations, develops and delivers advanced energy efficiency, renewable energy and pollution prevention technologies for industrial applications.

As part of its Industries of the Future initiative, OIT accelerates research and development of advanced technologies identified as priorities by the country's most energy and resource intensive industries. To improve industrial efficiency and competitiveness in the near term, OIT offers tools and resources on motor, steam, compressed air, and combined heat and power systems.

Project Partners

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